

Pinus flexilis Woodland Alliance

COMMON NAME	Limber Pine Woodland Alliance
PHYSIOGNOMIC CLASS	Woodland (II.)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	<i>Pinus flexilis</i> Woodland Alliance

CLASSIFICATION CONFIDENCE LEVEL Alliances are not ranked by NatureServe for classification confidence

USFS WETLAND SYSTEM Upland

RANGE

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This alliance is found at high elevations on O'Leary Peak in the project environs.

Globally

Stands included in this widespread woodland alliance occur intermittently throughout the Rocky Mountains and on mountains and plateaus in the Great Basin and Colorado Plateau, and on breaks in the northwestern Great Plains. The alliance ranges from Montana to New Mexico and from western North Dakota to southern California. It also likely occurs in southern Alberta and southeastern British Columbia, Canada.

ENVIRONMENTAL DESCRIPTION

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The one relevé sampled was found at an elevation of 2,725m on the southeastern side of O'Leary peak on a steep slope of 40%. The substrate was mainly cinder gravel and basaltic derived soils.

Globally

Woodlands included in this alliance occur intermittently from timberline to lower montane and foothill zones throughout much of the Rocky Mountains, on escarpments and other geographic breaks in the northwestern Great Plains, and in mountains in the Great Basin and southern California. Elevations range from 850-3500 m. Climate is semiarid, cold temperate. Annual precipitation patterns and amounts are variable, but locally the sites are typically xeric on exposed, windswept rocky slopes and ridges from subalpine to foothills and prairie breaks. Some stands are on eroded substrates and resemble 'badlands' while others may occur on lava flows. These open woodlands occur on all aspects, but are most common on dry south- and west-facing slopes. Soils are typically shallow, skeletal and coarse-textured such as gravelly, sandy loams or loams, but may include alkaline clays. Stands grow best on calcareous soils derived from limestone or sandstone, but parent material is variable and includes a variety of igneous, sedimentary, and metamorphic rocks. Depending on the stand, bedrock may include a mixture of andesite, basalt, cinder, lava, limestone, dolomite, granite, gneiss, quartzite, rhyolite, schist, sandstone, serpentine, or shale. Exposed bedrock is common and many stands have over 50% bare soil. Soil pH is typically neutral or slightly alkaline, but can range from acid to alkaline.

Adjacent vegetation at high elevations includes alpine meadows and shrublands and subalpine forests dominated by *Picea*, *Abies* or *Pseudotsuga*. Adjacent montane stands are dominated by *Pinus ponderosa*, *Pinus contorta* or *Pseudotsuga menziesii*. At lower elevations adjacent vegetation may include *Juniperus*-dominated woodland and savannas; shrublands dominated by species of *Artemisia*, *Cercocarpus*, or *Purshia tridentata*; dry prairie; or riparian woodland dominated by *Pseudotsuga menziesii*. The transition can be abrupt or an extended ecotone where the woodlands grade into a savanna.

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MOST ABUNDANT SPECIES

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Stratum

Tree canopy

Species

Pinus flexilis, *Pseudotsuga menziesii*, *Populus tremuloides*

Globally

Stratum

Tree canopy

Species

Pinus flexilis, *Pseudotsuga menziesii*

ASSOCIATED SPECIES

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Brickellia grandiflora, *Holodiscus dumosus*, *Ribes cereum*

Globally

Abies concolor, *Juniperus osteosperma*, *Juniperus scopulorum*, *Picea engelmannii*, *Pinus albicaulis*, *Pinus balfouriana*, *Pinus contorta*, *Pinus jeffreyi*, *Pinus longaeva*, *Pinus ponderosa*, *Arctostaphylos uva-ursi*, *Artemisia arbuscula*, *Artemisia nova*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Juniperus communis*, *Mahonia repens*, *Purshia tridentata*, *Rhus trilobata*, *Shepherdia canadensis*, *Symphoricarpos oreophilus*, *Yucca glauca*, *Achnatherum hymenoides*, *Bouteloua gracilis*, *Calamagrostis purpurascens*, *Carex rossii*, *Festuca idahoensis*, *Festuca campestris*, *Leucopoa kingii*, *Koeleria macrantha*, *Pseudoroegneria spicata*

VEGETATION DESCRIPTION

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The one Limber Pine Woodland relevé had a total vegetation cover of 40%, with 35% absolute cover in the tree layer, 2% in the shrub layer, and 5% in the herbaceous layer. Sixteen species occurred in this relevé.

The dominant species within the tree layer were *Pinus flexilis* (12% absolute cover), *Pseudotsuga menziesii* (8% absolute cover), and *Populus tremuloides* (7% absolute cover). The DBH for *Pinus flexilis* ranged from 13-19cm (average 15cm), *Pseudotsuga menziesii* ranged from 30-93cm (average 36cm), and *Populus tremuloides* ranged from 13-77.6cm (average 59cm). Tree height was distributed between 3-20m.

The shrub and herbaceous layer were sparse (7% absolute cover) with the dominant species being *Brickellia californica*, *Holodiscus dumosus*, and *Ribes cereum*.

Globally

Stands included in this widespread woodland alliance occur locally on warm, dry, rocky, exposed sites in the Rocky Mountain west, northwestern Great Plains, and desert mountains in the Great Basin and in southern and eastern California. Stands have an open canopy typically 3-10 m tall, but individuals may reach 15 m. The stands are solely dominated or codominated by the evergreen needle-leaved tree *Pinus flexilis*. Other trees species that may be present to codominant vary by geography and elevation zones throughout the woodland's range. In the subalpine, *Pinus albicaulis*, *Picea engelmannii* or *Pseudotsuga menziesii* may be present. In the montane zone, *Pinus contorta*, *Pinus ponderosa* or *Pseudotsuga menziesii* are frequently present, and in the lower montane transition zone from woodlands to grasslands or shrublands, *Juniperus osteosperma* or *Juniperus scopulorum* may co-occur with *Pinus flexilis*. In California, associates may include *Abies concolor*, *Pinus albicaulis*, *Pinus balfouriana*, *Pinus contorta*, *Pinus jeffreyi*, and *Pinus longaeva* (Sawyer and Keeler-Wolf 1995).

The understory vegetation is typically sparse because sites are dry and have a large cover of rock. On stands occurring in the breaks in the plains, Johnston (1987) reported 18% exposed rock and 25% bare soil. A sparse shrub layer may be present. The taller shrubs may include *Artemisia tridentata*, *Cercocarpus ledifolius*, *Jamesia americana*, *Rhus trilobata*, *Shepherdia canadensis*, *Symphoricarpos oreophilus* and immature tree species. The most frequent low shrubs are *Arctostaphylos uva-ursi*, *Artemisia arbuscula*, *Artemisia nova*, *Juniperus communis*, *Mahonia repens*, *Purshia tridentata*, and *Yucca glauca*. The herbaceous layer often dominates the understory. The most common species are graminoids such as *Bouteloua gracilis*, *Calamagrostis purpurascens*, *Carex rossii*, *Festuca idahoensis*, *Festuca campestris*, *Leucopoa kingii* (= *Festuca kingii*), *Koeleria macrantha*, *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), and *Pseudoroegneria spicata*. Scattered forbs may include species of *Achillea*, *Antennaria*, *Arenaria*, *Arnica*, *Astragalus*, *Erigeron*, *Eriogonum*, *Hymenopappus*, *Hymenoxys*, *Liatris*,

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Sedum, *Solidago*, and *Thermopsis*. In six relevés in the Little Missouri National Grassland in western North Dakota, the average cover for each of the strata was trees 38%, shrubs 21%, graminoids 20%, and forbs 9% (USFS 1992).

DATABASE CODE A.540

MAP CLASSES

Limber Pine Woodland Alliance is mapped as map class Limber Pine Woodland, map code 13.

Limber Pine Woodland Alliance occurs only in the environs of the study boundary on O'Leary Peak. The total area mapped within the park environs is 13 hectares within 9 polygons.

COMMENTS

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The one relevé sampled did not represent any of the previously described associations within the Limber Pine Woodland alliance. In order to classify this relevé it was placed at a coarser classification level within the Limber Pine Woodland alliance. This relevé may represent a new vegetation association, however sampling at additional locations is needed to verify this.

Global Comments

It may be difficult to determine which tree species are dominant in a mixed, montane or subalpine forest stand, especially when *Pinus flexilis* is seral on *Pseudotsuga menziesii* habitat type sites. Some stands included in this alliance are too sparse to be classified as woodlands, especially those growing on lava (Eggler 1941).

Global Dynamics

Although some of the conifers that are typically codominant in *Pinus flexilis* stands are late successional species, they are not likely to displace *Pinus flexilis*. This is because most of these stands occur on harsh sites where *Pinus flexilis* is more competitive than most other conifer species. These stands are generally considered to be topographic or edaphic 'climax' stands (Cooper 1975, Eyre 1980). Even in stands at lower elevations, such as prairie breaks, it is unlikely that other coniferous species will become dominant (Eyre 1980). Because *Pinus flexilis* occurs over a broad range of elevations, it can also be important as a post-fire seral species on drier sites in the Rocky Mountains (Cooper 1975, Peet 1988). Peet (1978) reported apparent competitive displacement with *Pinus flexilis* in Colorado. He noted that *Pinus flexilis* may dominate xeric sites from low to high elevations, except where *Pinus aristata* or *Pinus albicaulis* occur. There, *Pinus flexilis* is largely restricted to lower elevation, rocky sites. Peet (1978) also reported that *Pinus flexilis* occurs in the less xeric *Pinus contorta* and *Pinus ponderosa* habitats.

Birds and small mammals often eat and cache the large, wingless pine seeds. Most important is the Clark's nutcracker, which can transport the seeds long distances and cache them on exposed windswept sites (Lanner and Vander Wall 1980). This results in the regeneration of pines in clumps from forgotten caches (Eyre 1980, Steele et al. 1983).

REFERENCES

Cooper 1975, Eggler 1941, Eyre 1980, Lanner and Vander Wall 1980, Peet 1978, Peet 1988, Sawyer and Keeler-Wolf 1995, Steele et al. 1983, USFS 1992